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1908/09

*of Dec. 15, 1908*

# BULLETIN

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Marquette University



College of Engineering

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UNIVERSITY OF ILLINOIS

1908=1909

PRESIDENT'S OFFICE





# MARQUETTE UNIVERSITY

Six Departments.

Ninety-three Professors and Instructors.

Eight Hundred and Thirty-five Students.

## THE DEPARTMENTS ARE:

### I—*College of Arts and Sciences*

Logic, Metaphysics, Ethics, Political Science, Economics, History, English Language and Literature, Christian Evidences, Ancient Languages, German, French, Mathematics, Physics, Chemistry, Astronomy, Geology, Biology, Teachers' Course, Elocution, Oratory and Debate, Illustration and Mechanical Drawing, Vocal and Instrumental Music. The course extends over four years and leads to the degree of Bachelor of Arts (A. B.).

### II—*Department of Medicine*

The requirements for admission are those adopted by the Association of American Medical Colleges. The object of the department of medicine is to give such professional training to men and women as will make them successful in the actual practice of medicine. The course extends over four years and leads to the degree of Doctor of Medicine (M. D.).

### III—*Department of Law*

This department, now entering upon its sixteenth year, furnishes such legal training as will fit students for the practice of law or prepare them for greater success in business. The teaching staff is recruited entirely from the ranks of lawyers actively engaged in their profession. This gives the school a distinctly practical atmosphere, which is apt to be lacking in a strictly theoretical school, whose teachers have never been practitioners, or have retired from the active profession of the law. The course extends over three years; it offers excellent library facilities.

### IV—*Department of Dentistry*

The Department is a member of the National Association of Dental Faculties. Its diplomas are recognized by State Boards in every State in the Union. Candidates for admission must present credits showing that they have completed two years of high school work, or must pass a satisfactory preliminary examination. The course covers three years, consisting of thirty-two teaching weeks and six days in each week, and leads to the degree of Dental Surgery (D. D. S.).

### V—*Department of Engineering*

This Department has recently been added to the University. It is under the direction of Dean John C. Davis of Cornell. Dean Davis comes to Marquette highly recommended by the authorities of Cornell. The department will conduct courses in Civil Engineering, Mechanical Engineering, and Electrical Engineering.

### VI—*Department of Pharmacy*

The candidate must be at least eighteen years old and must have finished one year of high school work. Those who complete the full regular course of two years of eight months each year will receive the degree of Graduate in Pharmacy (Ph. G.). Those who finish the three year course will receive the degree of Master of Pharmacy (Ph. M.).

*Marquette Academy*—Classical, Pre-Medical, and Commercial Courses.

BULLETIN

UNIVERSITY OF ILLINOIS

PRESIDENT'S OFFICE

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# Marquette University

(Milwaukee, Wis.)

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COLLEGE OF ENGINEERING

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1908-1909



Press of  
Frederick Pollworth & Brother Company  
Milwaukee

LEGAL TITLE:

"MARQUETTE UNIVERSITY"  
OF  
MILWAUKEE, WISCONSIN

## BOARD OF TRUSTEES

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# FACULTY

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## Officers

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JOHN C. DAVIS, C. E.,

*Dean of the Engineering Studies.*



# FACULTY

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## Professors

JOHN C. DAVIS, C. E.,  
*Dean, Professor of Surveying and Mechanical Drawing.*

JOHN M. CUNNINGHAM, S. J.,  
*Professor of Oratory.*

JOHN B. HEMANN, S. J.,  
*Professor of English Language and Literature.*

JAMES L. McGEARY, S. J.,  
*Professor of Physics and Geology.*

THOMAS C. McCOURT, S. J.,  
*Professor of Chemistry and Mathematics.*

WILLIAM J. CORBOY, S. J.,  
*Professor of Mathematics.*

BERNARD A. ABRAMS,  
*Professor of German and French.*

WALTER D. MacLEITH,  
*Assistant Professor of Mechanical Drawing.*

LOUIS E. ECKSTEIN,  
*Registrar.*

## GENERAL STATEMENT

The College of Engineering may be said to be a natural outgrowth of the expansion of Marquette College into Marquette University. At the same time its organization is most opportune. For with the great development in industrial activity throughout the country, especially the Northwest, has come an increasing demand for the trained engineer. To equip men with all the requisites to supply this demand is the object of this department. It is hardly necessary to state that to accomplish this object a solid fundamental training in the various sciences, which make for a successful engineer, and in their cognate branches, is of vital importance. It is fairly obvious too, that this training can be best obtained not by a knowledge of the theories only, which are basal in the sciences of the engineering course, but especially by a thorough drilling in the principles evolved from them and by the application of those theories and principles to practice.

To attain this a corps of competent lecturers and instructors has been secured. At its head is Mr. John C. Davis. On his graduation from Cornell University in 1900, he took up railroad engineering and continued in it until 1905, covering during that period practically all the work connected with this branch.

The practical experience he thus acquired enabled him to illustrate with interest and accuracy the working out of theory in practice when he became a professor in his Alma Mater in 1905. He filled this position with unvarying success, cultivating always that combination of the theoretical and the practical which made him so valuable a member of the staff of Cornell University.

The courses of study are founded on the belief that the education of the engineer should in no sense be a narrow one, and that the more liberal his training is the more thoroughly his faculties will be developed, and the broader the field open to him the more certain will be his subsequent usefulness and success.

English is of great importance and is insisted on for the purpose of developing a correct and forceful style in expression and thought. Modern languages, too, are taught in order that the student may read at first hand and with pleasure and profit the scientific literature of foreign countries. These supplementary studies, while not being altogether essential to a course of engineering,

are, however, of such importance that an engineer can not be said to be educated who is lacking in a knowledge of them. Hence credits in these branches will be of great value in determining his standing and efficiency.

It is to the great advantage of the college that it is situated in a city like Milwaukee. For the many and varied engineering enterprises which are constantly in progress in the city afford exceptional opportunities to the student.

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## REQUIREMENTS FOR ADMISSION

Applicants for admission to the College of Engineering, as to all other departments of the University, must present satisfactory testimonials showing that they are young men of good moral character. Graduates from high schools are admitted on the credits which their graduation gives them; provided not more than one year and a half has passed since their graduation. In the event of a longer period having elapsed they will be admitted if they were, during that time, residents at some school, college or university.

When the applicant comes from another college or university he must present a certificate affording sufficient evidence of creditable standing and honorable dismissal. The faculty reserves the right to sever the continuance of students at college who have been admitted by certificate if they are found to be insufficiently prepared, and also the right to test by examination the records presented.

Since Algebra is vitally fundamental in this course, it is essential that a prospective student have a practical knowledge of its important operations. To insure this an examination in this subject is required of all candidates prior to their matriculation at the college.

Candidates not eligible to admission according to the above conditions may be admitted as special students to lectures and laboratory courses. They will be required to pass a satisfactory examination in the branches of a high school course in order to give evidence of their ability to carry on successfully the courses which they desire to enter.

Students who are not candidates for a degree are admitted to special courses after passing preliminary examinations in Algebra and Geometry.

## EXPENSES

Tuition per year - - - - - \$100.00

This is payable in two installments: \$50.00 on September 16th, and \$50.00 February 1st, ten days of grace being allowed. At the end of that time non-payment debars from classes. Matriculation fee, \$5.00.

No rebate is allowed on tuition paid, but when a student is forced, for valid reasons, to withdraw from college, the balance of the tuition representing that part of the semester for which he is absent may be redeemed in any other department studies within one year from date of withdrawal from the college.

A deposit of ten dollars at the opening of the session is required of all students in the Chemistry class to insure the University against loss by breakage in the chemical laboratory. The deposit will be returned at the end of the year after deductions have been made for breakage.

The college provides no dormitory system for students. Board and rooms may be obtained in the vicinity of the college at from \$4.00 to \$5.00 per week.

Information is furnished by the Registrar.

# CALENDAR

1908

Sept. 14-15—Examinations and Presentation of Certificates.

Sept. 14-15—Registration Days.

Sept. 16—First Semester begins.

Nov. 26-28—Thanksgiving Recess.

Dec. 21—Christmas Vacation begins.

1909

Jan. 4—Classes resumed.

Jan. 25-29—Final Examinations of First Semester.  
Entrance Examinations, Presentation of  
Certificates.

Jan. 30—End of First Semester.

Feb. 1—Second Semester begins. Registration.

Feb. 22—Washington's Birthday—Holiday.

Apr. 8-12—Easter Vacation.

May 1—President's Day—Holiday.

June 12-19—Final Examinations of Second Semester.

June 20—Commencement Week.

# COURSES OF INSTRUCTION

It is said that an engineer is a man "with some technical knowledge and trained judgment." The program of studies is designed to meet these two requirements. Great stress is laid on the development of the faculty of thinking logically and with quick scientific precision. For it is the belief that the education of the engineer does not consist so much in storing the mind with facts and figures, as in developing its powers, and training them to their full bent. Keeping this in view, even while giving the technical work of the course, the training of the student is conducted in such a way that at the end of the course he will have not only the technical knowledge required in his profession, but also the mental poise and the quickness and vigor of resolution to undertake and carry to completion successfully the many enterprises which an engineer is called on to manage.

Since a successful engineer is a leader in his profession, and his achievements a source of inspiration to the beginner, lectures will be given from time to time by prominent engineers, thus supplementing by their practical experience the theoretical knowledge gained by the student in the class room and laboratory.

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## OUTLINE OF COURSES

### **Civil Engineering**

#### FRESHMAN YEAR.

##### *First Semester.*

	Hours
English, Composition, Literature, Public Speaking	- 3
German or French	- - - - - 5
Advanced Algebra	- - - - - 5
Trigonometry	- - - - - 5
Chemistry	- - - - - 5

*Second Semester.*

	Hours
English, Composition, Literature, Public Speaking -	3
German or French - - - - -	5
Analytic Geometry - - - - -	5
Surveying, Theory and Practice - - - - -	5
Mechanical Drawing - - - - -	3
Chemistry - - - - -	5

SOPHOMORE YEAR.

*First Semester.*

	Hours
Calculus, Differential and Integral - - - - -	3
Physics - - - - -	4
Drawing and Descriptive Geometry - - - - -	5
Surveying, Theory and Practice - - - - -	3
Geology - - - - -	3
Materials of Construction - - - - -	3

*Second Semester.*

Physics - - - - -	4
Drawing and Descriptive Geometry - - - - -	3
Geology - - - - -	3
Mechanics of Engineering - - - - -	5
Chemistry - - - - -	5

JUNIOR YEAR.

*First Semester.*

	Hours
Mechanics of Engineering - - - - -	5
Engineering Laboratory - - - - -	4
Political Economy - - - - -	3
Railroad Engineering - - - - -	4
Municipal Engineering - - - - -	3

*Second Semester.*

Political Economy - - - - -	3
Railroad Engineering - - - - -	4
Structural Design - - - - -	4
Hydraulics - - - - -	5
Hydraulic Laboratory - - - - -	1



## SENIOR YEAR.

*First Semester.*

	Hours
Geodesy and Astronomy - - - - -	5
Water Supply - - - - -	2
Engineering Problems - - - - -	3
Structural Design - - - - -	4
Advanced Mechanics - - - - -	3

*Second Semester.*

Cartography - - - - -	2
Engineering Design - - - - -	4
Masonry and Foundations - - - - -	3
Reinforced Concrete Arch - - - - -	2
Bridge Engineering - - - - -	3
Railroad Engineering - - - - -	3
Sanitary Engineering - - - - -	3

**Mechanical and Electrical Engineering**

## FRESHMAN YEAR.

*First Semester.*

	Hours
English, Composition, Literature, Public Speaking -	3
German or French - - - - -	5
Advanced Algebra - - - - -	5
Trigonometry - - - - -	5
Chemistry - - - - -	5

*Second Semester.*

English, Composition, Literature, Public Speaking -	3
German or French - - - - -	5
Analytic Geometry - - - - -	5
Shop Work - - - - -	5
Chemistry - - - - -	5
Drawing - - - - -	3

## SOPHOMORE YEAR.

*First Semester.*

	Hours
Calculus, Differential and Integral - - - - -	3
Physics - - - - -	4

## 15

[illegible]

*Second Semester.*

[illegible]

## JUNIOR YEAR.

*First Semester.*

	First Semester							Hours
Mechanics of Engineering	-	-	-	-	-	-	-	5
Engineering Laboratory	-	-	-	-	-	-	-	4
Physical Laboratory	-	-	-	-	-	-	-	3
Kinematics	-	-	-	-	-	-	-	2
Shop Work	-	-	-	-	-	-	-	3

*Second Semester.*

[illegible]

SENIOR YEAR.

*First Semester.*

[illegible]

*Second Semester.*

Machine Design	-	-	-	-	-	-	-	-	2
Mechanical Laboratory		-	-	-	-	-	-	-	3
Electrical Laboratory	-		-	-	-	-	-	-	3
Mechanical or Electrical Design and Laboratory	-								9

# DEPARTMENTS OF INSTRUCTION

## English

### FRESHMAN YEAR.

(Three Periods a Week, Both Semesters.)

#### Precepts

Theory of Literature. Literary Aesthetics; the Beautiful; the Sublime; Laws of Criticism; Taste; Imagination; Sentiment.

Poetry. Nature and Division. Study of the Various Species. Pastoral. Lyric and Epic.

Text-Book. Coppens' Rhetoric, Reference, Sheran's Manual of Criticism.

#### Authors

(a) Reading. Literary Analysis and Discussion. Pastoral and Lyric.

Poets. Spencer's Astrophel, Milton's Lycidas, Shelly's Adonais, and Arnold's Thyrsis.

Masters of English prose. DeQuincey, Newman, Ruskin, Hawthorne.

Lyric and Epic Poetry. Milton's Paradise Lost and Selections from Palgrave, Book 3.

The prose Style of Dryden, Addison, Swift, and Johnson.

Text-Books. Palgrave, Golden Treasury (First Series), Books 3, 4, and Second Series.

(b) History and Criticism. Lake School to Victorian Age, inclusive (1745 to 1900).

From Elizabeth to Pope (1603 to 1730). Brook's Outlines. First Term: CC. 7, 8, 9, 10. Second Term: CC. 5, 6. Reference.

Composition. One paper a week, on subjects chiefly literary.

## Public Speaking and Debating

### FRESHMAN YEAR.

(Two Periods a Week in Both Semesters.)

The object of this course is to train the students of the Engineering Department to readiness and fluency in

speaking before an audience. To this end it is conducted according to strict parliamentary practice as is usual in debating societies. The literary and oratorical exercises are always under the direct supervision of a member of the Faculty. They are as follows:

Declamation and Elocutionary Reading of extracts from the classic drama or from model orations.

Criticism and discussion of interpretation and delivery by the Instructor, or by critics chosen from among the more advanced members.

Composition and reading of stories, poems, and essays, historical, critical or personal. Careful preparation by means of extensive reading and of consultation with the Instructor is prescribed for this exercise.

Set orations illustrative of the precepts of oratorical composition, on topics suited to the speaker and his hearers and written and delivered with a view to producing in the audience actually present the desired effect of convincing or of persuading to action.

Extempore speaking on questions discussed, or on matters of business proposed in joint session or transacted by committee.

The theory and practice of Parliamentary Law in deliberative assemblies. This constitutes the object of the vigilance of the chairman and of students chosen for this purpose. Extraordinary sessions, too, are called for the explicit and exclusive study of parliamentary practice.

Debates. The amount of time devoted to regular debates, the supervision exercised in the choice of questions, the assistance rendered in the preparation of argument, make this exercise the most profitable of all undertaken. Questions of interest of a political or historical or economic nature, prepared by a special committee, afford an opportunity to all students to engage in general discussion.

## **German**

FRESHMAN YEAR.

*First Semester.*

(Five Periods a Week.)

Preparatory work—Oral and Blackboard exercises, to secure correct pronunciation.

Grammar—Declension of nouns, personal pronouns, conjugation of *sein*, *haben* and *werden*. Declension of adjectives. Conjugation of regular verbs. Prepositions. Declension of possessive pronouns and demonstrative pronouns. Conjugation of irregular verbs.

Reading—Easy selections in prose and verse. German conversation throughout the semester.

Texts—Joynes—Meisner's Grammar; Joynes—Meisner's Reader, with Exercises.

### *Second Semester.*

(Five Periods a Week.)

Review of the First Semester's work—Irregular Verbs continued. Separable, inseparable, impersonal and reflexive verbs. Syntax.

Reading—Translation from English into German. Conversation in German.

Texts—Joynes-Meissner's Grammar. Reading to be selected from the following texts: Immensee—Storm; Deutsche Sagen—Geibler; Fritz auf dem Lande—Arnold; Der Zerbrochene Krug—Zschocke; Der Prozess—Benedix. Einer muss heiraten—Wilhelmi.

Translations—German Composition—Harris.

## **French**

FRESHMAN YEAR.

### *First Semester.*

(Five Periods a Week.)

Preparatory work—Drill in pronunciation.

Grammar—The Article, the Possessive and Demonstrative Pronouns. Conjugation of *avoir* and *être*. Formation of plural of nouns and adjectives; gender of nouns and adjectives. Regular verbs of the first conjugation, and the verb "*aller*."

Regular verbs of the second, third and fourth conjugations. Irregular verbs of the first and second conjugations.

Text—Grammar, Chardenal—First French Course.

Conversation. Easy selections in prose and verse.

Reading—Rollin's French Reader.

*Second Semester.*

(Five Periods a Week.)

Grammar—Thorough review of the first semester's work. Irregular verbs of the third and fourth conjugations; pronominal verbs.

Reading—Rollin's Reader continued.

Text—Chardenal—First French Course finished. Conversation throughout the semester.

**Mathematics**

FRESHMAN YEAR.

*First Semester.*

(Five Periods a Week.)

Wentworth's Plane Trigonometry. Functions of Acute Angles. The Right Triangle—Solution with and without Logarithms. The Isosceles Triangle. The Regular Polygon. Goniometry—Angles of any Magnitude—Functions of a Variable Angle, of Angles that differ by  $90^\circ$ ; of a Negative Angle; of the sum of Two Angles; of the Difference of Two Angles; of Twice an Angle; of Half an Angle. The Oblique Triangle—Laws of Sines, Cosines and Tangents. Application of Formulas. Areas.

Wentworth's Spherical Geometry and Trigonometry. The Right Spherical Triangle—Formulas for Solution from Two Given Parts; Napier's Rules. Spherical Polygons—Dimensions and Areas. The Oblique Spherical Triangle—Formulas for Half Angles and Sides; Gauss's Equations and Napier's Analogies; Solution from Three Given Parts. Problems.

(Five Periods a Week.)

Wentworth's Complete Algebra. Review. Ratio. Proportion. Variation. Series. Choice. Chance. Binomial Theorem. Indeterminate Coefficients. Theory of Numbers. Determinants. Theory of Equations.



*Second Semester.*

(Five Periods a Week.)

Wentworth's Analytic Geometry. Loci and Equations. The Straight Line. The Circle. Different Systems of Co-ordinates. The Parabola. The Ellipse. The Hyperbola. Loci of Second Order. Higher Plane Curves.

(Five Periods a Week.)

Surveying: Theory and Practice. Use of Instruments. The chain or tape in measuring lines and areas. The compass. The use and adjustment of the engineer's transit and wye-level. Practice in the field in measuring, surveying and leveling.

## SOPHOMORE YEAR.

*First Semester.*

(Three Periods a Week.)

Differential and Integral Calculus. Differentiation. Maclaurin's and Taylor's Theorems. Maxima and Minima; Evolutes and Envelopes. Tracing of Curves. Integration. The Definite integral. Lengths and Areas of Plane Curves. Surfaces and Volumes of Solids of Revolution. Application to Mechanics.

(Three Periods a Week.)

Surveying: Theory and Practice, Topographical, Hydrographical, Railway, City and Mining Surveying. The Use and Adjustment of the solar transit, of the sextant, of the plane table, etc.

**Drawing and Descriptive Geometry**

## SOPHOMORE YEAR.

*First Semester.*

(Five Periods a Week.)

Lettering, Orthographic Projections, Plane Sections, Conic Sections, Intersection of Surfaces, Developments, Geometric Perspective applied to Practical Problems.



*Second Semester.*

(Three Periods a Week.)

Working Drawings, Tracing and Blue Printing. Symbols, Contours, Profiles, Color Work, Designs of Screw Threads, Nuts, Bolts, Rivets, etc. Free hand Sketching from Machine Parts and Models, Stereotomy.

**General Chemistry**

FRESHMAN YEAR.

*First Semester.*

(Five Periods a Week.)

Text-book, Storer and Lindsay's Manual. Fundamental laws and theories studied in experiments and in the natural phenomena of every-day life. Some of the fundamental ideas used by chemists and the corresponding terms. The Laws of Definite, Multiple and Equivalent Proportions; Combining weights; Atomic weight, Units of Measurement; Calculations in Chemistry; Means of altering the speed of a given chemical action by change of temperature; Catalysis; Thermochemistry; The measure of the pressure of a gas; Boyle's Law; Mixed gases; Densities of gases; Acids: oxyacids; hydracids; Valency; The Kinetic-molecular hypothesis—applied to gases, to liquids, to solids; Solution; Limits of solubility; Equilibrium in a saturated solution; Avogadro's hypothesis; Gay Lussac's law of combining volumes; Atomic hypothesis; Non-metallic elements and their compounds.

*Second Semester.*

(Five Periods a Week.)

Metallic elements and their compounds. Special insistence is placed upon the various fundamental laws and hypotheses. Ionization; Changes taking place in electrolysis; Ionic migration; The hypothesis of ions; Applications to electrolysis; Ionic equilibrium; Relation of ionization to chemical activity; Salts; Ionic equilibrium treated quantitatively; Chemical relations of the elements; Electro-chemistry; Electro-plating; Photography.

Laboratory Exercises. William's Manual of Experiments supplemented by Arthur Stone Dewing's "National Chemistry Note-Book." Easier qualitative tests and determinations.

## **Analytic and Organic Chemistry**

SOPHOMORE YEAR.

*Second Semester.*

(Five Periods a Week.)

Qualitative Analysis: Explanations of the various chemical groups and methods of separation, with the detection of the metallic elements and acid radicals and determination of the more common organic acids. Wet and dry methods of examination. Explanations of Volumetric Analytic Methods; Acidimetry and Alkalimetry; Volumetric Processes in Sanitary Water Analysis.

Lectures: The Carbon compounds viewed in their theoretical and industrial aspects. The general principles of Organic chemistry, with characteristic reactions and tests of the more important radicals. Methods of preparation and purification; Melting and boiling point determinations as tests of purity and helps in the identification of organic compounds.

Laboratory Exercises: Systematic qualitative analysis; Group reagents and tests for metals; Tests for acid radicals; Volumetric Tests; Water Analysis; Tests for food, air and water. For reference von Meyer, Roscoe and Schorlemmer, Remsen, Ostwald, Mendeleeff, Muir, Thorpe, Fresenius, Noyes, Sutton, Long, Sommer, Smith, Amer. Chem. Jour., Chem. Zeit.

## **Physics**

ELEMENTARY MECHANICS, HYDROSTATICS AND PROPERTIES OF BODIES.

(Five Periods a Week in One Semester.)

A lecture and laboratory course employing to a great extent the units of the metric system in measurements

with verniers, micrometer screw, screw-gauge, comparator and cathetometer. Velocity and acceleration of falling bodies. Newton's laws of motion; momentum and the laws of energy; the lever, screw, wheel and axle and pulley as used in simple machinery. The pendulum as applied to clocks and as determining the force of gravity. Pressure exerted by a fluid; density of liquids; flotation. Pascal's law; law of Archimedes; methods of determining specific gravities; hydrometers and gauges; elasticity of liquids; hydraulic press; pumps and syphons; steam and water turbine, etc. Isotropic bodies; malleability and ductility; elasticity of volume; rigidity; elongation; Young's modulus; Hook's law; bending; torsional rigidity; elastic limit; elastic fatigue, etc.

#### ELEMENTARY LIGHT, HEAT AND SOUND.

(Five Periods a Week in One Semester.)

A lecture and laboratory course on the reflection and refraction of light; lenses and their use in the photographic camera; microscope; telescope, etc.

Determination by photometry of the candle power of lamps; velocity of light; dispersion; interference; color sensation; polarization, etc.

Thermometers and the laws of heat expansion in gases and liquids; expansion of metals; the law of Charles; absolute zero.

Calorimetry; melting and boiling points; latent heat of fusion; determination of the mechanical equivalent of heat; work done by a gas during expansion; steam pressure, superheated steam; steam and gas engines.

Wave motion, and water waves in their analogy to sound waves; velocity of sound in air; law of velocity of sound propagation; quality of sounds; musical scale; interference of sound waves; vibrations of strings; types of musical instruments; resonators; audition; consonance and dissonance; production of vocal sounds; phonograph, etc.

#### ELECTRICITY.

(Five Periods a Week in One Semester.)

A lecture and laboratory course, preparatory for special courses in Electrical Engineering, treating experimentally of the elements of practical electricity.

The object of the course is to familiarize the student with first principles in the heating, lighting, electrolytic and magnetic effects of currents. Batteries of various types, storage cells, spark coils, magnetos, dynamos and motors, telephone apparatus, galvanometers, voltmeters and ammeters are placed at his disposal for study and experiment.

## **Advanced Physics**

(Five Periods a Week in One Semester.)

(a) MOLECULAR PHYSICS AND HEAT.—A course of advanced laboratory work involving the determination of vapor pressures and densities, co-efficients of friction of gases and liquids, molecular electrical conductivities, freezing and boiling points, latent and specific heats, etc.

(b) LIGHT.—A course of advanced laboratory work in light, consisting of accurate measurements in diffraction, dispersion, interference and polarization.

(c) THE THEORY AND USE OF ALTERNATING CURRENTS. A discussion of stationary and moving currents, including transformers, transmission, various types of dynamos and motors, determination of energy factors, construction and use of special alternating current apparatus.

## **Geology**

SOPHOMORE YEAR.

(Three Periods a Week in Both Semesters.)

General course in Dynamic, Structural, Physiographic, Historical, and Economic Geology. Principles of Petrology, Mineralogy and Paleontology. Study of the field work of the Wisconsin Geological Survey. The College possesses a collection of the more important minerals and rocks; in addition to this the students have access to the Public Museum, the entire third floor of which is devoted to Geology.

Lectures, field work, identification of life forms, recitations and written exercises. For reference: Dana, Brigham, Le Conte, Geike, Scott, Nicholson and Lydek-

ker, Russell, Wright. Also the extremely valuable publications of the Wisconsin Geological Survey and the United States Geological Survey's Monographs and Bulletins.

## **Railroad Engineering**

JUNIOR YEAR.

(Four Periods a Week in Both Semesters.)

Railroad Construction and Location. Theory of railway curves, simple, compound and transition. Problems in locating turnouts, switches, side-tracks, and cross-overs. Methods of cross-sectioning and of computing quantities of cut and fill.

Maintenance of way. Organization of departments. Study of track, roadbed, and minor buildings. Improvement of old lines, double tracking, etc.

## **Structural Design**

JUNIOR YEAR.

*Second Semester.*

(Four Periods a Week.)

Theory and design of roof and bridge trusses. Determination of stresses in cantilever bridges, continuous and partially continuous bridges. Theory of suspension bridge. Problems and design of mill-buildings, a plate girder bridge, a riveted bridge, a pin-connected bridge, etc.

This work is continued in Senior year.

## **Hydraulics**

JUNIOR YEAR.

*Second Semester.*

(Five Periods a Week.)

Theoretical laws governing the flow of water through orifices, over weirs, and through long pipes, and open



channels, pressure upon submerged surfaces, including dams and reservoirs, and the theory of the pump, turbine and ram.

## **Hydraulic Laboratory**

JUNIOR YEAR.

*Second Semester.*

(One Period a Week.)

Application of the principles of Hydraulics to the design of water power plants, hydraulic accumulators, elevators, rams, riveting machines, turbines and centrifugal pumps, stream measurements and testing of turbines.

## **Municipal Engineering**

JUNIOR YEAR.

*First Semester.*

(Three Periods a Week.)

Economic Theory of the location and construction of country roads, design and construction of city streets and pavements, paving materials, etc.

## **Geodesy and Astronomy**

SENIOR YEAR.

*First Semester.*

(Five Periods a Week.)

Use of instruments and methods of observation, triangulation methods, computation of the geodetic coordinates, Spherical Trigonometry, Astronomic methods, with the determination of Time, Azimuth, Latitude and Longitude, etc.

## **Cartography**

SENIOR YEAR.

*Second Semester.*

(Two Periods a Week.)

Pen topography. Elements of map drawing, tinting and shading, drawing of maps from the field notes taken from a topographical survey.

## **Water Supply**

SENIOR YEAR.

*First Semester.*

(Two Periods a Week.)

Water works design and construction, quantity and quality of potable water; choice of supply; the designing of distribution systems, reservoirs, dams, elevated tanks, etc.

## **Engineering Problems and Advanced Mechanics**

SENIOR YEAR.

*First Semester.*

(Three Periods a Week.)

Kinematics, statics and kinetics, especially with reference to problems in engineering, as in dams, retaining walls, friction and motive power, etc.

## **Engineering Design**

SENIOR YEAR.

*Second Semester.*

(Four Periods a Week.)

After becoming proficient in mechanics, resistance of materials and other fundamental subjects the student is expected to design in detail and to draw up the specifications and contracts for an isolated or central power plant.

## **Masonry and Foundations**

SENIOR YEAR.

*Second Semester.*

(Three Periods a Week.)

Principles of construction in the use of stone, concrete and brick, the use of limes, cements and mortars.

## **Reinforced Concrete Arch**

SENIOR YEAR.

*Second Semester.*

(Two Periods a Week.)

Theory and use. Cements, natural and Portland. Theory and design of reinforced beams, columns and footings. Review of systems in common use.



## **Bridge Engineering**

SENIOR YEAR.

*Second Semester.*

(Three Periods a Week.)

Simple bridge trusses, cantilever, suspension, swing and arch bridges. Theory of Bridge Design; plate-girder bridge, riveted bridge, pin-connected bridge. Problems.

## **Sanitary Engineering**

SENIOR YEAR.

*Second Semester.*

(Three Periods a Week.)

Sewers and Sewage Disposal, General Principles of Sanitation. Preliminary surveys, details of construction, separate system, combined system, methods of disposal, street cleaning.

## **Mechanics of Engineering**

JUNIOR YEAR.

*First Semester.*

Strength of Materials. The laws of stresses and deformations in different materials of construction. Methods of determining the shearing forces and bending moments in beams. Fundamental formulae for designing parts of machinery, of beams, shafts, riveted joints, etc.

## **Engineering Laboratory**

JUNIOR YEAR.

*First Semester.*

Use and adjustment of scientific engineering apparatus. Operation and testing of steam and gas engines, boilers, pumps, and other engineering devices. Tests of the strength of materials in tension, compression, cross-bending and torsion. Experimental study in cement and concrete mixtures. Tests of paving brick and building stone, etc.

## **Shop Work**

FRESHMAN YEAR.

*Second Semester.*

(Five Periods a Week.)

Use of woodworking tools. Turning, carpentry, and patternmaking, bench and vise work, the use of machine tools and blacksmithing.

This work is continued throughout the Sophomore and Junior years.

### **Kinematics**

JUNIOR YEAR.

*First Semester.*

(Two Periods a Week.)

Mechanisms and Machines; analysis of links, belting, velocity, diagrams, cams, gears, and other contact mechanisms; kinematical synthesis, machine tools, automatic machinery, etc.

### **Steam Machinery**

JUNIOR YEAR.

*Second Semester.*

(Three Periods a Week.)

The steam engine and valve gears. Zeuner and Bilgram diagrams, analysis of flat, piston, unbalanced, single-ported, and multi-ported valves, with fixed, shifting and swinging eccentrics; theoretical indicator cards for simple and compound engines, valve ellipse, valve and piston velocity diagrams, link motions, radial gears, Corliss, etc. Dynamics, fly-wheels and governors; analysis of steam distribution in high, medium and slow speed engines, simple and compound; analysis of stresses in rims and arms of fly-wheels; theory and practice in the design and operation of Corliss, throttling and shaft governors. Boilers; different types, theory of combustion; smoke prevention, feed water purification, and prevention of corrosion, etc.

This work is continued in the First Semester of Senior year.

### **Electrical Machinery**

JUNIOR YEAR.

*Second Semester.*

(Three Periods a Week.)

Theory of direct and alternating current dynamos and motors; their design, construction and installation. Arc and incandescent lighting systems, street railway ap-

pliances, electric heating and forging, electrolytic processes, etc. Telephony and telegraphy.

This course is continued in First Semester of Senior year.

## **Materials of Construction**

SOPHOMORE YEAR.

*First Semester.*

(Three Periods a Week.)

Wood, stone, brick, cement, concrete, iron, steel, paints, explosives, etc. Their physical properties. Methods of testing.

## **Mechanics of Engineering**

*Second Semester.*

(Five Periods a Week.)

Kinematics, statics, and kinetics, especially with reference to problems of engineering, as in dams, retaining walls, friction and motive power. Strength of materials, beams, girders, columns, rivets, joints, etc.

## **Machine Design**

SENIOR YEAR.

*First Semester.*

(Five Periods a Week.)

Principles of Mechanics. Strength and properties of materials. Theory for proportioning screws, bolts, nuts, keys, cotters, shafting, couplings, hangers, belt and rope drives, friction and tooth-gearing, cranks, eccentrics, connecting rods, pistons, crossheads, guides, stuffing boxes, valves, riveted joints and machine tools.

Continued in Second Semester.

## **Mechanical Laboratory**

SENIOR YEAR.

*First Semester.*

(Four Periods a Week.)

Testing of materials of construction. Lubrication and oil testing. Calorific value of fuels. Pyrometry.

Continued in Second Semester.

# GENERAL INFORMATION

## Library Facilities

The magnificent public library of the city, containing 187,000 volumes, is within three minutes' walk of the University. The arrangement of the library is an ideal one for students, who have access to all the books for consultation and study, and may with special privilege take home with them as many books as are necessary for the preparation of essays, debates, etc.

In the history room are over 48,000 volumes, including 2,250 on Philosophy, 15,240 on Sociology, 7,177 on Travel, 11,087 on Biography, and 11,900 on History.

The literature room contains 15,000 volumes, among which are American, English, French, German, Grecian, Roman, Italian, Spanish, Portuguese literatures, also a goodly number of the Swedish, Danish, Dutch, Flemish, Semitic and Slavic, and many books of Japanese, Chinese and Celtic literatures.

The science room has 12,000 volumes. On the different shelves are books on Natural Science, Mathematics, Physics, Electricity, Chemistry, Geology, Biology, Archaeology, Paleontology, Botany, Zoology, Birds, Mammals, Engineering and Agriculture.

The College Library contains 11,000 volumes. Its circulating department, accessible to the members twice a week, comprises standard English works on science and literature carefully selected with a view to the needs of the students.

The Reading Room, open every day, affords those resorting to it ample opportunities of becoming acquainted with the current news, and of forming sound opinions upon all important questions. Leading journals, magazines, reviews, and a valuable collection of works of reference are at the service of the members.

## Museum

The University is within a few minutes walk of the Public Museum, where students can supplement the

study of the class-room by actual observation. The doors of the museum are open to the public daily at 9:00 a.m.

Following is the inventory as it stood on August 31, 1906:

Mineralogical and geological specimens.....	7,923
Paleontological specimens.....	15,301
Botanical specimens.....	24,404
Zoological specimens .....	175,961
Archaeological specimens.....	20,607
Ethnological specimens.....	4,368
Arms, armors, carvings and other objects contained in the Rudolph J. Nunnemacher collection.....	3,079
Coins, bank notes, medals, etc.....	2,852
Books, pamphlets, maps, etc.....	12,730
Total.....	<hr/> 276,495



## EXAMINATIONS

Examinations are held semi-annually at the end of each semester. The work done during the semester, as well as the examinations, is considered in the grading of students. The results of the examinations are marked:

A, 95—100%

B, 85—95%

C, 75—85%

Grade C is required for passing. D (60-75%) indicates a condition. E (below 60%) shows failure. Regularity of attendance at lectures and laboratory, and faithfulness in the performance of daily work are of as much weight in determining the standing of students in their classes as are the examinations.

CONDITIONS.—Conditioned students must remove such conditions at the examinations given for that purpose during the following semester. Failing in this the student is obliged to discontinue the subject in which he is conditioned and to repeat it during the next semester.

For a special examination of this kind a fee of \$1.00 is charged.



# STUDENT ORGANIZATIONS

The social life of the University is fostered by the following literary, musical and athletic societies:

## **Marquette Oratorical Association**

Was organized in November, 1883. Its principal object is to prepare the student for public speaking, and to store his mind with a fund of facts and arguments on questions of history and literature. The Moderator is appointed by the Faculty, the other officers are chosen by the members.

## **The Marquette University Journal**

Is a periodical edited five times a year by a board of editors of Marquette University, and published on the 25th day of every second month. Its aim is three-fold: 1st, to bring to higher proficiency the literary expression of students of all departments; 2d, to chronicle the literary, social and athletic events of the University; 3d, to serve as a channel of communication between old and attending students.

## **Marquette University Mandolin Club**

Mandolins, 10; Guitars, 2; Violins, 7; Flutes, 2; Cornet, 1; Clarinet, 1; Violoncello, 1; Double-bass, 1; Snare-drum, 1; Timpani and Piano.

## **The Marquette Orchestra**

Contains the following instruments: First Violins, 6; Second Violins, 5; Viola, 1; Violoncellos, 2; Double-basses, 2; Flutes, 3; Clarinets, 2; Cornets, 2; French Horns, 2; Trombone, 1; Timpani and Bass and Snare Drums.

## **The Marquette University Brass Band**

The Marquette University Brass band had a select membership of sixteen last year. It was made up of the



following instruments: 4 Cornets, 2 Clarinets, 1 Piccolo; 3 Altos; 2 Tenor Trombones; 1 Baritone; 1 Tuba, and Bass and Snare Drums.

### **Glee Club**

Student in any of the University departments, having the necessary qualifications are eligible to membership in the Glee Club. Two half hour periods weekly are given to vocal culture, accompanied by instruction in musical theory and correct interpretation. Four part compositions of medium difficulty form the basis of the exercises. There are no fees attached to membership or charges for instruction; but regularity in attendance at club rehearsals is imperative, and an absolute condition of membership.

A special function of the Glee Club is to furnish the vocal music at University exercises.

### **Marquette University Athletic Association**

The object of this association is to furnish the students with the best facilities for the promotion of general athletics. Realizing the necessity of suitable recreation and relaxation of both mind and body for those engaged in mental pursuits, the University authorities have at all times encouraged manly sports among the students. However, only those who are regular in class attendance and up to the standard in class work are allowed to take part in any athletic contests in which the University is represented.

The removal of the old Library and Gymnasium from the grounds at State and Eleventh Streets has made possible the conversion of these grounds into the Marquette University Campus which is considered one of the best athletic fields in the West. This is at the disposal of the students of all the departments and is within easy access of all. The campus is of regulation size for both football and baseball, and is surrounded by a running track sixteen feet in width and almost one-fifth of a mile long.

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UNIVERSITY OF ILLINOIS

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PRESIDENT'S OFFICE



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